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238. Proposed by PROF. R. D. CARMICHAEL, Anniston, Ala.

Solve the differential equations

$$\begin{aligned} (a) \quad & (x+y^2)dx + (x^2+y)dy = 0, \\ (b) \quad & (x+xy+y^2)dx - (x^2+xy-y)dy = 0. \end{aligned}$$

MECHANICS.

200. Proposed by C. N. SCHMALL, 89 Columbia Street, New York City.

An elastic string whose weight is W is laid over the top of an inclined plane so as to remain at rest. Determine how much the string will be elongated, knowing, M =modulus of elasticity, L =normal length of string, and ϕ =inclination of the plane.

201. Proposed by G. B. M. ZERR, Ph. D., Parsons, W. Va.

ABC is an inclined plane, perfectly rough, length $AC=l$. The time for a sphere to roll down when AB is base is to the time for a cylinder to roll down when BC is base as m is to n . Find AB and BC .

AVERAGE AND PROBABILITY.

187. Proposed by HENRY HEATON, Belfield, N. D.

Through every point of a given square straight lines are drawn in every possible direction, terminating in the sides of the square. What is the average length of such lines?

188. Proposed by J. EDWARD SANDERS, Reinersville, Ohio.

Find the average length of a hole at random through a given (a) sphere, (b) cube.

MISCELLANEOUS.

169. Proposed by E. D. ROE, Ph. D., Syracuse University, Syracuse, N. Y.

Find the value for all finite values of k of

$$\lim_{x \rightarrow \infty} \left[x^k \log \left(\frac{e^x + 1}{e^x - 1} \right) \right].$$

170. Proposed by J. W. NICHOLSON, A. M., LL. D., Baton Rouge, La.

If n and m are any two real numbers whatever, n being less than m , find a rational r such that $\sqrt[n]{n} < r < \sqrt[m]{m}$.